Case Report

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Multiple Morphological Radial Artery Variants with Odds of Increased Procedural Complications in Percutaneous Coronary Procedure and Clinical Implications

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Abstract

Anatomic variants occurring in the radial artery often occur in singles, but occasionally may have 2 or more co-existing variants. Some of the variants may be etiologic in procedural complications when employed as vessel of choice in percutaneous coronary procedure. We present a brachioradial artery with multiple coexisting anatomic comorbidities that may increase probabilities of procedural complications when employed as vessel of choice in transradial percutaneous coronary procedure occurring in the left limb of a 68-year-old female cadaver. Variants encountered included high origin, the artery arising medially from the third part of the axillary artery (brachioradial), hypoplasty of the artery (diam. < 1.8 mm) plus some moderate tortuosity occurring in the artery just proximal to the cubital fossa, and more significantly, the artery presenting with a stenotic proximal origin.

Artery at origin ran medially and posteriorly placed to the ulnar nerve, then coursed superolateral, impinging on the ulnar nerve. Just proximal to the cubital fossa, artery travelled some length anteriorly placed to the median nerve before adopting the morphology of a normal radial artery in the forearm. Radial artery presenting with multiple coexisting variants will likely increase odds of procedural complications, including procedural elongation or failure in percutaneous coronary procedure. Thus, documenting radial artery variants provides surgeons, specialists, and radiologists with interventional insights.

Keywords: Percutaneous coronary procedure; High origin radial artery; Radial artery stenosis; Tortuosity; Transradial vs transfemoral procedure; Procedural complications

Introduction

Increasingly, the radial artery (TRA) is used over the femoral artery (TFA) for percutaneous coronary procedure. Preference of TRA over TFA has resulted from more favorable outcomes, including fewer bleeding complications, better cost effectiveness, decreased hospital stay, decreased mortality or morbidity rates, and fewer access site complications [1].

Campeau (1989) was the first to use TRA as an alternative vessel of access to TFA, reporting only a 2% unsuccessful rate; from this Campeau predicted TRA may prove more effective and possibly safer than TFA [2]. Kiemeneji and Laaman (1995) considered TRA stent implantation technique a safe approach, yielding high success rates and low incidence of bleeding complications, even during aggressive anticoagulation and confirmed TRA may be associated with increased patient comfort and may facilitate shortened hospitalization times and significant cost reduction [3].

Based on the evidence, TRA and TFA are the two main approaches used as a diagnostic and therapeutic purpose in catheterization. During a complete institutional transition from TFA to TRA, Kadev et al. (2014) compared the short- and long-term outcomes of TRA versus TFA in primary percutaneous using cardiovascular death and major adverse cardiac event (MACE) as primary end

- points, a composite of death, stroke, reinfarction, and target vessel revascularization, at 30 days and 1 year. At 30 days, TRA compared to TFA was associated with a significant reduction of cardiovascular mortality, significant MACE reduction, and fewer access-site complications. At one year, the cardiovascular mortality and MACE rates also favored the TRA group [4]. Roussanov et al. (2008) employed multiple categories in determining cost-effectiveness, including access cost, catheter cost, contrast cost, closure device cost, and recovery cost for the TRA vs TFA to diagnostic cardiac catheterization; they reported that access cost was significantly higher in the Radial Group, catheter cost significantly lower in the TRA Group, contrast cost significantly lower in the Radial Group, but closure device cost significantly higher in the TRA than in TFA Group. Recovery cost was reported significantly lower in the Radial Group compared with the Femoral Group without closure device use [5].

Although TRA has numerous advantages over TFA, radial artery variants including high origin, size, tortuosity, loops, and stenosis are among the artery's morphological anatomic features reported etiologic in procedural complications, including procedural elongation and failures. Other complications include longer radiation exposure as concerns TRA [1]. The usual radial artery begins 1 cm distal to the intercondylar line at the elbow, but the artery may arise proximal to the elbow either from the axillary artery (AA), or from the brachial and are called the brachioradial artery (BRA), brachial, or superficial brachial artery (SBA). The BRA is reported occurring in 1 of 7 individuals with a 13.8% incidence, originating most frequently from the upper third brachial (65 plus or minus 4%) [6]. Thus, recognizing arterial branching variations in the upper limb can guide surgeons (orthopedics, vascular, hand) and interventional cardiologists in selecting appropriate surgical interventions and assist neuroradiologists in interpreting of mages.

Case report

In the differential diagnosis of nonspecific abdominal pain, mesenteric ischemia is one of the first diagnoses that come to mind [5]. As in our case, typical lesions (trombus, nonocclusive lesion or embolism) were not observed in angiography of the patient with mesenteric ischemic prediagnosis, it brought to mind the diagnosis of MALS. To ensure the diagnosis before interfering the stenosis, CTA was repeated and the diagnosis was confirmed. Otherwise, if we interfered with the stenosis percutaneous, it would be impossible to open the stent where the ligament encircled and be iatrogenically embolized or the procedure would result in complication like vascular injury that we could not even think. We want to emphasize with our case that MALS should be brought to mind when interfering mesenteric arteries. The physicians dealing with vascular invasive intervention should evaluate the lesions with clinical experiences and have skeptical approach (**Figure 1,2**).

The main treatments of MALS are endovascular intervention, open surgery (intraperitoneal and retroperitoneal), robotic and laparoscopic surgery, coeliac ganglionectomy and percutaneous coeliac plexus blockade [6-9]. Our case recuperated with open surgery.

Conclusion

Multiple Morphological Radial Artery Variants with Odds of Increased Procedural Complications in Percutaneous Coronary Procedure and Clinical Implications is explains the proximal to

Figure 1 The image shows a radial artery arising proximal to the cubital fossa as the brachioradial artery (BRA).

The brachioradial artery initially was placed medially and posterior to the ulnar nerve. The artery coursed superolateral, impinging on the ulnar nerve. The brachioradial artery crossed the median nerve just proximal to the median nerve (MN). The brachioradial artery exhibited moderate tortuosity just proximal to the cubital fossa. Artery was placed in the usual position of the radial artery in the forearm.

AA: Axillary Artery

LR: Lateral Root, MR; Medial Root

UN: Ulnar Nerve

MN: Median Nerve

CBM: Coracobrachialis Muscle

Figure 2 The median and ulnar nerves were pushed away to reveal the proximal stenotic origin of the brachioradial artery.
UN: Ulnar Nerve
MN: Median Nerve Stenosed Origin
St.BRA: Stenotic Brachioradial Artery
MCN: Musculocutaneous Nerve

the cubital fossa, artery travelled some length anteriorly placed to the median nerve before adopting the morphology of a normal radial artery in the forearm. Radial artery presenting with multiple coexisting variants will likely increase odds of procedural complications, including procedural elongation or failure in percutaneous coronary procedure. Thus, documenting radial artery variants provides surgeons, specialists, and radiologists with interventional insights.

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